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A Comparative Study of the Styles of Compositæ.

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Plates CXIX–CXX.

(Continued from page 186).

Helianthoideæ (Plate CXIX, Fig. 1-36).

Gray[37] says: "Style branches of hermaphrodite or sterile flowers (or the undivided style in some of the latter) truncate or continued in a hairy appendage."

Bentham[38] says: "Style branches vary in different genera from the truncate tips of the *Senecio* to the appendiculate branches of Asteroideæ, or the subulate hispid branches of Vernoniaceæ."

In this tribe, as stated by Gray and Bentham, there is considerable variation. Yet this variation, as far as my observations go, would enable us to make a division of the tribe, as in Asteroideæ, though not so marked. The styles of the sterile hermaphrodite disk flowers are undivided, except in *Polymnia*, with a truncate bunch of brush hairs, or the brush hairs covering the entire surface. These characters are constant in all genera I have studied. The style of the pistillate flowers is also uniform, being either two-branched with the branches linear, acute with stigmatic papillæ in two rather wide lines along the edges, or they occupy the entire inner surface. In all cases the style of the fertile hermaphrodite flowers is two-branched. The stigmatic papillæ occurring on the inner surface and the brush hairs form a triangular appendage at the tip.

[37] L. c., p. 59.
[38] L. c., p. 379.

On these characters the following division of the tribe could be made:

DIVISION I.

Hermaphrodite florets sterile, style entire, except in *Polymnia*, with a truncate appendage of brush hairs, or linear obtuse with brush hairs covering the whole surface. This division includes the genera: *Silphium*, *Polymnia*, *Berlandiera*, *Iva* and *Xanthium*.

DIVISION II.

Hermaphrodite flowers fertile, with a two-branched style. The branches have a triangular tip, the brush hairs cover the outer surface of the branch, and extend down a part or the entire distance to the base, occurring also on the inner surface at the very tip. The papillæ cover the entire inner face or occur in two very wide lines. This division includes the genera: *Helianthus*, *Tetragonotheca*, *Eclipta*, *Echinacea*, *Rudbeckia*, *Lepachys*, *Borrichia*, *Actinomeris*, *Coreopsis*, *Bidens*, *Baldwinia* and *Galinsoga*.

DIVISION I.

Silphium[39] (Plate CXIX, Fig. 1-5).

S. perfoliatum, L. Style of the hermaphrodite sterile flowers entire, cylindrical, obtuse. Brush hairs cover the entire surface for about three-fourths of its length (Fig. 4). They are large, broad at the base, and with an acute point (Fig. 5). Style branches of the pistillate flowers long and acute. Stigmatic papillæ cover the entire inner surface (Figs. 1, 2). The papillæ (Fig. 3) are short and obtuse.

Polymnia[40] (Fig. 6).

P. Canadensis, L. Sterile style is two cleft. The branches are entirely covered with brush hairs, which are very short and broad (Fig. 6).

Berlandiera (Fig. 7).

B. subcaulis, Nutt. The branches of the pistillate flowers are smaller than in *Silphium*, and the papillæ are in two wide

[39] Gray, l. c., p. 61. Hildebrand, l. c., p. 29.
[40] Gray, l. c., p. 60.

lines along the edges of the branch. Papillæ are shaped similar to those of *Silphium* (Fig. 7).

Iva (Fig. 8-10).

I. xanthiifolia, Nutt. The style of sterile hermaphrodite flowers is undivided, narrow at the base, and gradually enlarging to the tip. The brush hairs are in a truncate tuft at the tip of the style (Fig. 9). Brush hairs obtuse and not as long as in *Silphium* (Fig. 10). The branches of the pistillate style are short, acute, with the stigmatic papillæ in two lines along the edges. The papillæ (Fig. 8) are more acuminate than in *Silphium*.

Xanthium (Fig. 11-13).

X. echinatum, L. The style of the sterile hermaphrodite flower is nearly cylindrical, undivided, with brush hairs covering the entire surface for about one-fifth of the length of the style (Fig. 12). Brush hairs broadly obtuse (Fig. 13). Stigmatic papillæ are rather large and somewhat acute (Fig. 11).

DIVISION II.

Helianthus, (Plate CXIX, Fig. 27, 28).

H. rigidus, Desf. The branches have a triangular shaped tip with the brush hairs covering the entire outer face and the tip of the inner face. The stigmatic papillæ cover the entire inner face except the tip (Figs. 27, 28). The brush hairs are large and acuminate. In *H. tuberosus* the three cleft style was also found. In some of these three cleft styles it seemed as though the third branch was formed by the division of one of two original branches, but in most cases all three of the branches were of equal length and seemed to be wholly separate.

Heliopsis (Fig. 14, 15).

H. helianthoides (L.), B. S. P. The style is the same as in *Helianthus*. The brush hairs do not cover the entire outer surface, but only the outer tip. The papillæ cover the entire inner face, or are in two very wide lines, appearing as one wide line occupying the whole inner surface.

The stigmatic papillæ (Fig. 15) are larger than those of *Silphium*, while the brush hairs (Fig. 14) are smaller.

Tetragonotheca (Fig. 16, 17).

T. Ludoviciana (T. & G.), Gray. The branches of the style have a very slender tip. The brush hairs cover the outer face along the upper two-thirds of the branch. The longest hairs occur where the branches begin to taper. The papillæ are in two lines along the edges of the inner face and are of about average size (Fig. 17). The brush hairs (Fig. 16) are larger than those of any other genus studied.

Eclipta (Fig. 18).

E. alba (L.), Hassk. The style has the same general structure as in *Helianthus*, but it was so small that the exact form was hard to determine. The papillæ (fig. 18) are short and obtuse.

Echinacea (Fig. 19-20).

E. angustifolia, DC. Branches of the style long and tapering. The brush hairs occupy a little more than one-half of the branch, covering the outer face and the tip of the inner. The longest hairs occur just below the tip, (fig. 19). The papillæ cover the entire inner surface and are of average size, (fig. 20).

Rudbeckia (Fig. 21-22).

R. subtomentosa, Pursh. The branches are like those of *Helianthus* except they do not taper so much. The long and slender brush hairs cover the outer face of the branches for their whole length, (fig. 21). The papillæ, (fig. 22) cover the entire inner face.

Lepachys (Fig. 23-24).

L. pinnata (Vent.), Torr. & Gray. Style branches a little shorter than in *Helianthus*, very slender, tapering above the end of the stigmatic lines. Brush hairs cover not only the outer face for nearly its entire length, but also the inner face above the end of the stigmatic lines. As compared with *Rudbeckia* the hairs are short and broad, (fig. 23). The papillæ are in two lines on the inner face for about one-half the length of the branch. They are very short and obtuse, (fig. 24).

Borrichia (Fig. (25-26).

B. arborescens (L.), DC. The branches are slender and about one and a half times as long as in *Helianthus*. The brush

hairs cover the tip of the inner face and the entire outer for about half of its length, (fig. 25). The large stigmatic papillæ cover the entire inner face, (fig. 26).

Actinomeris (Fig. 29-30).

A. alternifolia (L.), DC. Branches much the same as in *Helianthus*. The brush hairs, which are most abundant at the tip, cover the entire outer face nearly the entire length of the branch. They are broader and shorter than in most of the other genera, (fig. 29). The papillæ are in two very wide lines on the inner face and are quite small and narrow, (fig. 30).

Coreopsis (Fig. 31-35).

C. palmata, Nutt. The entire style is in general like *Helianthus* (fig. 31-35).

Galinsoga (Fig. 36).

G. parviflora, Cav. Branches of the style about one-fourth as long as *Helianthus*. Brush hairs cover the outer face for about two-thirds of its length, (fig. 36). Papillæ are in two broad lines on the inner face.

HELENOIDEÆ[41] (Plate CXIX. Fig. 37–42). ANTHEMIDEÆ[41] (Plate CXX. Fig. 1-8). SENECIONIDEÆ[41] (Plate CXX. Fig. 8-14).

These tribes will be considered together since the styles are much alike. In all three tribes the hermaphrodite perfect flowers have a two branched style with the brush hairs either (1) in a truncate bunch at the tip of the branch, or (2) covering the entire or part of the outer face of the branches and forming a slightly triangular tip.

In the three genera of Anthemideæ which I have examined, the truncate bunch of brush hairs is present, and the stigmatic papillæ are arranged in two lines along the edges of the inner face. In Helenioideæ two of the three genera examined had the truncate bunch of brush hairs as in Anthemideæ, the other genus having long and somewhat triangular tipped branches, with the brush hairs covering a part of the outer surface. In Senecionideæ one of the three genera examined has the truncate bunch of brush hairs, the two others have a triangular or an obtuse tipped

[41] Gray, l. c. pp. 70, 77, 79. Bentham, l. c. pp. 381, 382, 384.

branch with the brush hairs on the outer face? In these tribes, therefore, the style characters are not uniform. They are of two divisions, one of which might be mistaken for Helianthoideæ.

HELENIOIDEÆ, (Plate CXIX. Fig. 37-42).

DIVISION I.

The style branches of the hermaphrodite perfect flowers are short, with a distinct bunch of brush hairs at the tip. Papillæ arranged in two comparatively wide lines along the edges of the flattened branches. This division includes the genera *Helenium* and *Actinella.*

DIVISION II.

Branches of the style in the hermaphrodite perfect flowers are considerably longer than in division I, brush hairs distinctly not truncate forming only a slight enlargement. Brush hairs occupy the outer face for about one-third of its length. The papillæ are in two lines on the inner face. This division includes the genus *Dysodia.*

Helenium (Fig. 37-40).

H. antumnale, L. Style branches are essentially as described in division I. The brush hairs (fig. 39) are cylindrical, obtuse. The papillæ, (fig. 40) are short and obtuse.

Actinella (Fig. 41–42).

A. linearifolia (Hook.), Torr. & Gray. Style branches as in *Helenium*, only somewhat broader and shorter. Brush hairs as in Fig. 41, and stigmatic papillæ as in Fig. 42.

Dysodia (Fig. 43).

D. chrysanthemoides, Lag. Branches of the style as described for division II. Brush hairs shorter and broader than in *Helenium.*

ANTHEMIDEÆ (Plate CXX. Fig. 1-10).

In the *Anthemideæ* the three genera examined have a truncate bunch of brush hairs, as division I of *Helenioideæ*. The style branches are somewhat broader and shorter than in that tribe.

Achillea (Fig. 1-4).

A. Millefolium, L. The style branches the same as in the tribe (fig. 1-3). The brush hairs (fig. 4) are broad and short.

Matricaria (Fig. 5).

M. inodora, L. Branches of the style in the perfect hermaphrodite flowers are like those of *Achillea* but not so long, which applies also to the brush hairs and papillæ.

Artemisia (Fig. 6-10).

A. Ludoviciana, Nutt. Style branches of perfect hermaphrodite flowers same as in *Achillea* but shorter. Brush hairs (fig. 8) are longer and narrower. Papillæ (fig. 9-10) are a little larger. The style branches of the pistillate flower, acute with the papillæ in two lines along the edges, (fig. 6-7).

SENECIONIDEÆ (Plate CXX. Fig. 11-16).

Two kinds of styles occur in *Senecionideæ* corresponding to those of *Helenioideæ*. The first division with a truncate bunch of brush hairs as in *Senecio*. The second division with triangular or obtuse tips is represented by *Petasites* and *Arnica*.

Senecio (Fig. 11-12).

S. aureus, L. The style branches are as in division I of *Helenioideæ*. Brush hairs (fig. 11) are almost like those of *Artemisia*, but more acute. Papillæ shown at Fig. 12.

Petasites (Fig. 13-14).

P. palmata (Ait.), Gray. Branches of the style are very short compared with its length. The tips of the branches are somewhat triangular. Brush hairs cover the outer faces entirely, the longest ones being at the tip. Papillæ cover the entire inner surface except a small part at the tip (fig. 13). Brush hairs from the tip and base of branch (fig. 14).

Arnica (Fig. 15–16).

A. Chamissonis, Less. Branches of the style terete or nearly so, and obtusely tipped. Brush hairs (fig. 16) cover the outer face for about two-thirds of its length. They are longer and more numerous at the tip. The stigmatic papillæ (fig. 15) in two wide lines on the inner face with only a very narrow zone between them.

CYNAROIDEÆ (Plate CXX, fig. 17-21).

Branches of the style in the perfect hermaphrodite flowers are obtusely or slightly acutely pointed. The brush hairs cover the

entire outer face as far down as the base of the branches and sometimes farther. The papillæ are in two lines or cover the entire inner face.

Cnicus (Fig. 17-18).

C. altissimus, var. *discolor* (Muhl.), Gray. The style branches are very long cylindrical with a slight acute tip. The brush hairs cover the entire outer face as far down as the base of the branches, ending just below the base of the branches in a tuft of somewhat longer hairs (Fig. 17). The papillæ are in two moderately wide lines on the inner face, and extend the whole length of the branch. The brush hairs (fig. 18) are rather short and acute.

Centaurea (Fig. 19-21).

C. Americana, Nutt. Branches of the style are very short aud obtuse. Brush hairs cover the entire outer face of the branches, and extend below the forks for about one-third of the entire length of the style (fig. 19-20). The papillæ occupy the entire inner face of the branches. Brush hairs (fig. 21) are longer than in *Cnicus* and are acuminate.

CICHORIACEÆ (Plate CXX, fig. 22-23).

In this tribe only one genus was examined, viz:

Taraxacum (Fig. 22-23).

T. officinale, Weber. Branches of the style are moderately long and terete. Brush hairs cover the entire outer face, and edges and tip of the inner face of the branches. They extend below the fork for about the length of the branches, and cover the style completely. The style is slightly enlarged below the fork. The papillæ occupy the entire inner face not covered with brush hairs (fig. 23).

CONCLUSION.

From these observations I would say in conclusion that, while there is not enough uniformity in the characters of the style, within the various tribes, to absolutely separate the different tribes in all cases, yet in most cases there is uniformity enough to aid greatly in classification. As has been pointed out by Bentham and Gray, it is impossible to rely upon a single absolute character for the whole order.

In some of the tribes the characters are more constant and uniform than in others. In the tribes Vernoniaceæ, Eupatoriacæ and Asteroideæ, the characters of the style are very uniform and constant for each tribe, and therefore can be used with great advantage. In the tribe Asteroideæ, sufficient structural differences occur in the genera studied to make two divisions.

In the tribes Helianthoideæ and Cynaroideæ, the characters are sufficiently uniform and constant to be of great aid, though not as much as in Vernoniaceæ, Eupatoriaceæ and Asteroideæ.

In the Helenioideæ, Anthemideæ and Senecionideæ, there is less uniformity and constancy. The style structure is similar in all three tribes, and is of two general kinds. One is constant and distinct for the three tribes, but the other is not sufficiently distinct to prevent its being confused with Helianthoideæ, but it would hardly be mistaken for Vernoniaceæ, Asteroideæ, or Eupatoriaceæ. In these tribes, therefore, the style characters cannot be used as distinctive marks for each tribe, but for the three tribes considered collectively.

Another difficulty met with is in diœcious flowers of Inuloideæ and Helianthoideæ. In these tribes the characteristic arrangement of the brush hairs and stigmatic papillæ cannot be used as characters, since the flowers are either sterile or fertile and pistilate, and so do not possess both brush hairs and stigmatic papillæ. In the tribe Cichoriaceæ only one genus was studied, and so no conclusions can be drawn as to the constancy of the style characters.

So we find, that while the style characters like other characters are of great value in some cases, in others they fail, and must be used in connection with some other characters in order to establish tribes.

Finally, I desire to express my thanks to Prof. L. H. Pammel, for his supervision and direction of my work, and to Mr. W. Zmunt, for carefully retracing my drawings.

EXPLANATION OF PLATES.

Plate CXVII.

Figs. 1–5.—*Vernonia Arkansana*, DC. 1–3 style × 30; 4, portion of fig. 1 enlarged × 60; 5, brush hairs × 500.

Fig. 6.—Brush hairs of *Elephantopus Carolinianus*, Willd. × 500.

Figs. 7–11.—*Kuhnia eupatorioides*, L. 7–8, style × 30; 9, portion of fig. 7 enlarged × 60; 10, brush hairs × 500; 11, stigmatic papillæ × 500.

Figs. 12–14a.—*Mikania scandens*, (L.) Willd. 12, style × 30; 13, portion of style × 150; 14, brush hairs × 500; 14a, stigmatic papillæ × 500.

Figs. 15, 16.—*Eupatorium altissimum*, L. 15, brush hairs × 500; 16, stigmatic papillæ × 500.

Figs. 17, 18.—*Brickellia Wrightii*, Gray. 17, brush hairs × 500; 18, stigmatic papillæ × 500.

Figs. 19, 20.—*Liatris squarrosa*, (L.) Willd. 19, brush hairs × 500; 20, stigmatic papillæ × 500.

Figs. 21–23.—*Trilisia paniculata*, Cass. 21, 22, brush hairs × 500; 23, stigmatic papillæ × 500.

Plate CXVIII.

Figs. 1–3.—*Solidago Canadensis*, L. 1, style × 30; 2, portion of style × 60; 3, brush hairs and stigmatic papillæ × 500.

Figs. 4, 5.—*Grindelia squarrosa*, Dunal. 4, brush hairs × 500; 5, stigmatic papillæ × 500.

Figs. 6, 7.—*Heterotheca*. 6, brush hairs × 500; 7, stigmatic papillæ × 500.

Figs. 8, 9.—*Chrysopsis villosa*, Nutt. 8, brush hairs × 500; 9, stigmatic papillæ × 500.

Figs. 10, 11.—*Aplopappus racemosus*, Torr. 10, brush hairs × 500; 11, stigmatic papillæ × 500.

Figs. 12, 13.—*Bigelovia nudata*, (Michx.) DC. 12, brush hairs × 500; 13, stigmatic papillæ × 500.

Figs. 14, 15.—*Brachychæta cordata*, Torr. & Gray. 14, brush hairs × 500; 15, stigmatic papillæ × 500.

Figs. 16, 17.—*Bellis integrifolia*, Michx. 16, brush hairs × 500; 17, stigmatic papillæ × 500.

Figs. 18, 19.—*Townsendia eximia*, Gray. 18, brush hairs × 500; 19, stigmatic papillæ × 500.

Fig. 20.—Brush hairs, staminate flower of *Baccharis halimifolia*, L. × 500.

Figs. 21, 21a.—*Seriocarpus asteroides* (L.) B.S P. 21, stigmatic papillæ × 500; 21a, brush hairs × 500.

Figs. 22–28.—*Aster-Novæ Angliæ*, L. 22, style of hermaphrodite × 30; 23, portion of style × 60; 24, style of pistillate flower × 30; 25 portion of fig. 24 enlarged × 60; 26, stigmatic papillæ of pistillate flower × 500; 27, brush hairs of hermaphrodite flower × 500; 28, stigmatic papillæ × 500.

Figs. 29–33.—*Erigeron Philadelphicus*, L. 29, 30, style × 30; 31, portion of style × 60; 32, brush hairs × 500; 33, stigmatic papillæ × 500.

Figs. 34, 35.—*Aphanostephus ramosissimus*, DC. 34, brush hairs × 500; 35, stigmatic papillæ × 500.

Figs. 36, 37.—*Boltonia asteroides*, L'Her. 36, brush hairs × 500; 27, stigmatic papillæ × 500.

Fig. 38.—Style of staminate flower of *Baccharis halimifolia*, L. × 50.

Figs. 39, 40.—*Pluchea camphorata*, (L.) DC. 39, style × 30; 40, brush hairs × × 500.

Figs. 41–44.—*Antennaria plantaginifolia*, (L.) Hook. 41, style of staminate flower × 50; 42, brush hairs of same × 500; 43, style of pistillate flower × 60; 44, stigmatic papillæ of same × 500.

Plate CXIX.

Figs. 1–5.—*Silphium perfoliatum*, L. 1, style of pistillate flower × 30; 2, portion of style × 60; 3, stigmatic papillæ × 500; 4, portion of style of hermaphrodite flower × 30; 5, brush hairs × 500.

Fig. 6.—Brush hairs of sterile flower of *Polymnia Canadensis*, L.

Fig. 7.—Stigmatic papillæ of pistillate flower of *Berlandiera subcaulis*.

Figs. 8–10.—*Iva xanthifolia*, Nutt. 8, stigmatic papillæ of pistillate flower × 500; 9, style of sterile hermaphrodite flower × 50; 10, brush hairs × 500.

Figs 11–13.—*Xanthium echinatum*, L. 11, Stigmatic papillæ of pistillate flower × 500; 12, style of sterile flowers × 50; 13, brush hairs × 500.

Figs. 14, 15.—*Heliopsis helianthoides*, (L.) B. S. P. 14, brush hairs × 500; 15. stigmatic papillæ × 500.

Figs. 16, 17.—*Tetragonotheca Ludoviciana*, (T. & G.) Gray. 16, brush hairs × 600; 17, Stigmatic papillæ × 500.

Fig. 18.—Stigmatic papillæ of *Eclipta alba*, (L.) Hassk. × 500.

Figs 19, 20.—*Echinacea angustifolia*, DC. 19, brush hairs × 500; 20, stigmatic papillæ × 500.

Figs 21, 22.—*Rudbeckia subtomentosa*, Pursh. 21, brush hairs × 500; 22, stigmatic papillæ × 500.

Figs. 23, 24.—*Lepachys pinnata*, (Vent.) Torr. & Gray. 23, brush hairs × 500. 24, stigmatic papillæ × 500.

Figs 25, 26.—*Borrichia arborescens*, (L.) DC. 25, brush hairs × 500; 26, stigmatic papillæ × 500.

Figs. 27, 28.—*Helianthus rigidus*, Desf. 27, style of *Helianthus rigidus* × 30; 28, portion of style × 60.

Figs. 29, 30.—*Actinomeris alternifolius*, (L.) D.C. 29, brush hairs × 500; 30, stigmatic papillæ × 500.

Figs. 31–35.—*Coreopsis palmata*, Nutt. 31, 32, style × 30; 33, portion of style × 60; 34, brush hairs × 500; 35, stigmatic papillæ × 500.

Fig. 36.—Brush hairs of *Galinsoga parviflora*, Cav. × 500.

Figs. 37–40.—*Helenium autumnale*, L. 37, style × 30; 38, portion of style × 60; 39, brush hairs × 500; 40, stigmatic papillæ × 500.

Figs. 41, 42.—*Actinella linearifolia* (Hook), Torr. & Gray. 41, brush hairs × 500; 42, stigmatic papillæ × 500.

Fig. 43.—Brush hairs of *Dysodia chrysanthemoides*, Lag. × 500.

Plate CXX.

Figs. 1–4.—*Achillea Millefolium*, L. 1, style × 30; 2, style × 50; 3, stigmatic papillæ × 500; 4, brush hairs × 500.

Fig. 5.—Brush hairs of *Matricaria inodora*, L. × 500.

Figs. 6–10.—*Artemisia Ludoviciana*, Nutt. 6, style of pistillate flower × 30; 7, stigmatic papillæ of same × 500; 8, brush hairs of perfect flower × 500; 9, 10, stigmatic papillæ of same × 500.

Figs 11, 12.—*Senecio aureus*, L. 11, brush hairs × 500; 12, stigmatic papillæ × 500.

Figs 13, 14.—*Petasites palmata*, (Ait.) Gray. 13, stigmatic papillæ × 500; 14, brush hairs × 500.

Figs. 15, 16.—*Arnica Chamissonis*, Less. 15, style × 30; 16, brush hairs × 500.

Figs. 17, 18.—*Cnicus altissimus*, var. *discolor*, (Muhl.) Gray; 17, style × 30; 18, brush hairs × 500.

Figs. 19–21.—*Centaurea Americana*, Nutt. 19, 20, style × 30; 21, brush hairs × 500.

Figs. 22, 23.—*Taraxacum officinale*, Weber. 22, style × 30; 23, brush hairs × 500.

On the Evolution of Parasitic Plants.

When we observe the complete parasitism of *Phoradendron*, *Arceuthobium* and *Conopholis*, it is difficult to conceive that time was when they grew wholly in the ground. It is not necessary to use the expression, now common, that their ancestors were terrestrial. There seems no reason why these plants, as now existing, may not in the past have grown wholly in the ground.

When we consider the immense number of parasitic Loranths, and the close relation of that order to Santalaceous plants, we might assume some considerable evolution in order to bring the former to the parasitic condition, but for the fact that we find members of the latter family partially parasitic In 1853 Mr. Jacob Stauffer of Lancaster, Pa., published a paper with drawings of a parasitic *Comandra umbellata*. Carefully washing out roots I could find no such attachment, but have since been rewarded by a beautiful case. The *Comandra* was obtaining most of its support from an attachment to a large root of *Vaccinium stamineum*. A case with an English ally of *Comandra*, *Thesium linifolium*, is noted in Bromfield's Flora Vectensis, and approvingly referred to in the third edition of Gray's Text Book. What is there to prevent that which is occasional from becoming habitual and permanent?

Partial parasitism is observed in many families. Mr. Stauffer, in the paper cited, illustrates *Gerardia quercifolia* and *Gerardia flava* in a similar condition, but I have never been able to find a case. This has also been reported of *Castilleia*. I exhibited at the Boston meeting of the American Association for the Advancement of Science carefully prepared colored drawings by Lunzer of *C. coccinea* showing its partial parasitism on the roots of grasses. So far as these instances are concerned it is clear that a plant may easily assume the habit of attachment without any serious modification of structure. We want only some illustrations of

seeds usually germinating in earth, sprouting and penetrating the bark from birth.

Passing from the chlorophyllous to the aphyllous parasites, I can vouch for the germination of seeds of *Aphyllon fasciculatum* directly on the stems of Geraniums when planted as cuttings beneath the soil; and carefully washing out the earth from *Aster corymbosus* in a locality where *A. uniflorum* is abundant, have seen the young plants starting from its fibres. *Epiphegus* I have also found in the earlier stages of growth attached to beech roots. On the other hand plants, which are scarcely parasites, have seed sprouting on bark to which the plant subsequently becomes attached. It is not always the decaying bark which receives the sprouting seed of the epiphyte. *Tillandsia usneoides* sprouts on the clear, glossy green bark of the orange tree. This may also be a partial parasite, though no direct penetration of the parts has been discovered. Dr. Chalkley Palmer analyzed the ashes, finding silica, iron, alumina, manganese, lime, magnesia, potash, soda, sulphur, chlorine, carbon and phosphorus. It is inconceivable that the Spanish moss should derive all these from the atmosphere.

I am convinced that a large number of root parasites require nothing but the ordinary earth to sprout their seeds in, and that many will live through their whole individual existence with nothing more in the soil than ordinary soil affords. My companion, in 1873, in Rocky Mountain exploration, Mr. Josiah Hoopes, found *Castilleia* seeds that grow as do any ordinary seed; and Mr. Isaac C. Martindale has recorded in the Botanical Gazette and Mr. Brown in the BULLETIN OF THE TORREY CLUB that *Orobanche* will germinate in ordinary garden earth, and go on with its development through all its stages as a well behaved member of the vegetable kingdom ought to do. I have shown in a recent issue of the Botanical Gazette that *Sarcodes sanguinea* has the same character. I have found *Monotropa* in soil with the slightest modicum of vegetable matter as often as actually among decaying leaves. Mrs. Harker, of Mount Holyoke Seminary in 1888, found *Cuscuta* germinating in the earth, which after finding something to fasten its fangs into, by the twisting of its stem, drew its roots out of the ground to die. It would be interesting to watch

and prevent parasitism, and then see how a *Cuscuta* would behave. *Corallorhiza* at the time of flowering has a large mass of coral-like tissue at the base. Transplanting these I find the plants live and flower several years. *Sarcodes sanguinea* with a similar and larger mass has not grown the second year for me.

It is clear that there is a varying power of adaptation in parasitic plants much greater than is generally supposed, affording a fine field for the student in evolution. I read a paper on this subject at the Boston meeting above cited; but, annoyed at the mysterious disappearance from the President's desk of my carefully prepared drawings, I did not publish it. But with some recent interest manifested the above facts may be worth recording.

THOMAS MEEHAN.

GERMANTOWN, PA.

The Giant Sundew Heliotropic.

The *Drosera* of all American *Droseras* is the *D. filiformis*, and its abundance in the low ground at this time of the year is particularly striking. The round leaved species (*Drosera rotundifolia*) covers the otherwise bare white moist sand in many places and sends up its slender scapes bearing the small, erect, pale pink blossoms, while in the more grassy areas associated with the common pale yellow leaved pitcher plant (*Sarracenia flava*), the *Drosera filiformis*, thrives in all its attractiveness. At a distance of a few rods the blooms of this sundew might be mistaken for the rich orchid, *Calopogon tuberosus*, as the flower, fully an inch across, has the same beautiful bright purple color. The smooth erect scape is about a foot and a half high, therefore exceeding somewhat the extremely viscid filiform leaves which unroll from the top as they unfold. After a few days the old leaves have secured many small insects, and their neatness and peculiar beauty in the morning sun are somewhat impaired thereby.

But it is with the behavior of the blossoms that this note has particularly to do. Aside from the scape being many-flowered and the raceme hanging down like the bend of a shepherd's crook, it may be said that this curve straightens out fast enough, so that a new flower is brought out each day to the top of the bend, when it displays its rich colored corolla and showy yellow an-

thers. Most interesting of all is the fact that the blossom invariably faces the morning sun; at least in counting a hundred or more to-day there was not a single exception save in one case, and that was caught in the " hook " of its neighbor and faced northeast instead of east. Our giant sundew, among its many attractions is therefore prominently heliotropic so far as its beautiful purple blossoms are concerned.

BYRON D. HALSTED.

OCEAN SPRINGS, MISS., May 11, 1891.

Flora of Richmond Co., N. Y.--Additions and New Localities, 1890.

APPENDIX No. 6.

Ranunculus Ficaria, L. Willow Brook. Scarce.

Ranunculus lacustris, Beck & Tracy. (*Ranunculus multifidus*, Pursh). In a single pond hole, Ocean Terrace.

Ranunculus septentrionalis, Poir., replaces *R. fascicularis* of our Catalogue.

Hesperis matronalis, L. Annadale.

Lechea racemulosa, Lam., listed as occurring at Tottenville, proves to be an error in determination.

V. blanda, Willd. var. *amœna*, (Le Conte), B.S.P. Clove Valley.

Hypericum Canadense, L. *var. majus*, Gray. Garretsons. (Mrs. N. L. Britton).

Tilia Americana, L. Near Richmond. (Wm. T. Davis).

Nemopanthes mucronata, (L.), Trel. Giffords. (Wm. T. Davis).

Euonymus Europæus, L. Tottenville.

Fragaria Indica, Andr. Garretsons. (Miss Timmerman).

Eupatorium hyssopifolium, L. Pleasant Plains.

Eupatorium perfoliatum, L., var. *truncatum*, Gray. Oakwood.

Aster Radula, Ait. Mariners Harbor. (R. G. Eccles).

Aster vimineus, Lam. Garretsons.

Erigeron ramosus (Walt.), B.S.P., var. *discoideus* (Robbins) B.S.P. New Dorp.

Hieracium aurantiacum, L. Rossville.

Lactuca Canadensis, L. A peculiar form with linear, entire leaves. New Dorp.

Oxycoccus macrocarpus, Pers. Annadale. (Wm. T. Davis).

Veronica Chamædrys, L. Princes Bay. (Mrs. N. L. Britton).

Plantago major, L., var. *minima* (DC.), Decne. Richmond Valley.

Alnus glutinosa, Willd. Todt Hill.

Salix purpurea, L. Rossville.

Populus heterophylla, L. Near Green Ridge. (Wm. T. Davis).

Microstylis unifolia (Michx.), B.S.P. Ocean Terrace. (Miss C. A. Timmerman). Abundant near Egbertville.

Liparis Loeselii, (L.) Rich. Garretsons. (Miss C. A. Timmerman).

Habenaria blephariglottis (Willd.), Torr. Mariners' Harbor. (R. G. Eccles).

Habenaria ciliaris, (L.) R. Br. Old Place. (Wm. T. Davis.) Arlington. (Dr. R. G. Eccles.) Bogardus Corners.

Belamcanda Chinensis (L.), Red. Tottenville.

Tradescantia Virginica, L. Bogardus Corners.

Lemna trisulca, L. Clove Valley. (Thos. Craig).

Eleocharis palustris (L.), R. Br. var. *glaucescens* (Willd.) Gray. Common.

Scirpus Olneyi, Gray. New Dorp.

Panicum miliaceum, L. Todt Hill.

Glyceria distans (L.), Wahl. New Dorp. ARTHUR HOLLICK.
N. L. BRITTON.

Notes on Fungi affecting Leaves of Sarracenia purpurea in Minnesota.

Sarracenia purpurea is found abundantly in tamarack swamps and river-bottom morasses in the vicinity of Minneapolis. Almost all plants in certain tamarack swamps are affected with *Sphærella Sarracenia*, (Schw.), Sacc., and this is the most common parasite on the living leaves. It produces circular, confluent blood-red or crimson spots, generally appearing first near the mouth of the "pitcher," and gradually covering the whole leaf. Associated with this, *Leptosphæria scapophila*, (Peck), Sacc., is not uncommon, and has been collected also on plants growing in open morasses. *Pezisa abrata*, mentioned in Farlow and Seymour's "Host-Index," 1888, as occurring on *S.*

purpurea, must be very rare in the vicinity of lakes, as no specimens have been seen.

In addition to these plants already indexed, *Pestalozzia aquatica*, E. E., Journal of Mycology, V. 157, perhaps occurs on Minnesota *Sarracenia*. Some doubtful references to this species have been made.

Two hyphomyetous imperfect forms, apparently undescribed, are abundant in some open morasses upon Minnesota *S. purpurea*. A description of these is ventured.

{ *Helminthosporium Sarraceniæ*, n. s.
{ *Brachysporium Sarraceniæ*, n. s.

The names are bracketed because there seems to be doubt whether both should not be referred to the same plant. Both *Brachysporium* and *Helminthosporium* conidia were noted in the same tufts, and it was found impossible to separate the two upon purely vegetative characters.

HELMINTHOSPORIUM SARRACENIÆ, n. s.

On dead leaves of *Sarracenia purpurea*: forms circular, black, velvety, somewhat confluent spots over whole affected leaf. Fertile hyphæ erect, fasciculate, swollen nodally 75 : 150=3.5 : 7.5μ. brown, muleate. Conidia continuous to 4—septate, smooth, long-ovoid 7.: 15=3 : 8.μ.

BRACHYSPORIUM SARRACENIÆ.

On dead leaves of *S. purpurea*. Vegetative characters all as in *Helminthosporium Sarraceniæ*. Conidia, almost spherical, generally devoid of pedicels, pluriseptate, of from eight to twelve cells, dark fuscous or carbonaceous, echinulate 15 : 30=15 : 30μ.

Under the artificial classification at present, perforce, adopted by mythologists, it was thought best to describe this plant under both form genera. The writer is of the opinion that only one plant is really in question.

Specimens from which descriptions were made, were collected by Mr. E. P. Sheldon, in Ramsey Co., Minn.

CONWAY MACMILLAN.

Botanical Notes.

The herbarium of the late Dr. C. C. Parry, has recently been carefully arranged and catalogued, and the list is now in press.

The collection is particularly rich in western and southern plants, and would make a very valuable addition to an eastern herbarium which lacks those plants. It is now offered for sale by Mrs. Parry, and copies of the list will be sent, (when issued), on application to Mrs. E. R. Parry, Davenport, Iowa.

Nyssa Sinensis is a new species of Tupelo described by Prof. D. Oliver in Hooker's Icones Plantarum, Plate 1964. The genus was formerly supposed to be confined to eastern North America, but has been found in the Himalayas, and this last species was collected by Dr. A. Henry in China. It is a small tree, about 20 feet high with ovate lanceolate, acuminate leaves, and pedicelled ovaries.

A Monument to Linnæus. The Chicago Herald of May 22d, contains an account and representation of the monument to Linnæus, presented to the City of Chicago by the Swedish Linnæan Monument Association. The figure of the great botanist is of bronze, upon a granite pedestal and when completed will have four allegorical figures at the base, representing four of the sciences in which he was distinguished.

Hepaticæ Americanæ, L. M. Underwood and O. F. Cook. We have recently received numbers 80-100, including recent collections in Florida by Prof. Underwood, in Mexico by Pringle, Macoun's British Columbia, Leiberg's Idaho, and New England specimens from A. W. Evans in the following genera: *Anthoceros*, *Asterella*, *Chiloscyphus*, *Frullania*, *Jubula*, *Jungermania*, *Lejeunia*, *Lepidozia*, *Lophocolea*, *Marsupella*, *Nardia*, *Plagiochila*, *Porella*, and *Radula*. E. G. B.

Potamogeton Javanicus, Hassk. and its Synonymy. Dr. Hans Schinz (Bull. Soc. Bot. Suisse i., 52-61). Dr. Schinz shows that the plant hitherto known as *P. tenuicaulis*, F. Von Müller, and *P. pavifolia*, Buch., and sometimes erroneously regarded as synonymous with our North American *P. hybridus*, Mx., from North Australia, Formosa, Japan and Korea, should bear the older name *P. Javanicus*, Hassk. T. M.

Reviews of Foreign Literature

Contribution a l'Histoire Naturelle de la Truffe. A. Chatin. (Bull. Soc. Bot., France, xxxviii. 54-64).

Four species of Truffles are described; *Tuber nucinatum*, *T. heimalbum*, *T. brumale*, and *T. montanum*. They are associated all through France with *Tuber melanosporum* or *T. cibarium*, the "Truffe du Périgord" of the markets, and are often confounded with it, and, when possible, sold as such. In Algeria, Tunis and Morocco, a species of Truffle is known as *Terfâs*, and is the Mizy, or Mison, that in the days of Pliny the Romans obtained from Carthage and Lybia. It is the *Tuber niveum* of Desfontaines, the *Chæromyces*, and later, the *Terfezia Leonis* of of Tulasne Three species of African and Arabian *Terfâs* are described as *Terfezia Leonis*, Tulasne, *T. Boudieri* and *T. Boudieri*, var. *Arabica*, and a fourth is given a new generic as well as specific name, *Tirmannia Africana*. They are gathered in great quantities, and for many months are one of the most important of the caravan supplies. A. M. V.

Ueber Schutzmittel des Laubes gegen Transpiration, besonderes in der Flora Javas. A. F. W. Schimper: (Sitzungsberichte der Berl. Akadem. der Wissenschaften, 1890, S. 1045.)

Protective characters against a too rapid transpiration have, up to the present time, except in one or two cases caused by climatic changes, been recognized as found only in plants inhabiting deserts or extremely dry localities. (Xerophytes).

The observations communicated in the present paper (later to be enlarged and illustrated) have led to the remarkable conclusion that dryness of habitat is by no means the only influencing factor which may be active in causing the development of protective characters against transpiration.

Such characters are found quite universal in sea-shore (Halophytes) and alpine plants, and in temperate zones in all woody evergreens.

The sea-shore and alpine plants the author has recently throughly studied in Java, with the results communicated in the following paper.

I.—Sea-shore plants: (Strandpflanzen, Halophytes).

It is already well known that concentrated solutions of common salt exercise a retarding influence on transpiration, and

that these regarding influences, beginning with 0.5, increase as the concentration increases.

Pfeffer* explaines this by saying that a concentrated salt solution has the same effect on the plant as a relatively dry soil would have, i.e. makes it very difficult for the plant to procure its necessary water. Experiments conducted by the author show that a concentrated solution of sodium chloride almost wholly destroys the assimilation of starch or glucose, so that neither are formed to any extent in the plant.

Germinating seedlings of corn were cultivated in a normal culture solution, both with and without a 0.5 (Proc.) solution of common salt. The first remained for three months, during the time of the experiment, without change and perfectly healthy ; the second in a similar solution but without salt, in the same time grew to very large dimensions. The plants cultivated with the salt solution contained neither starch nor glucose, while the other set of plants had their tissues filled with both. Plants cultivated in solutions with less salt give similar results, but less pronounced. Like results were obtained with a series of different plants, and the author deduces the following conclusion with respect to all halophytes, which invariably possess some kind of protective characters, just as desert plants do, to ensure them against a too rapid transpiration, and for the following reasons:

1. On account of the very greatly increased difficulty for such plants to obtain their water supply, while growing in salt water or a soil saturated by the same.

2. Because concentrated salt solutions in the plant cells wholly check the assimilative activity.

3. Because still more concentrated solutions cause the death of the plant.

In Java the sea-shore plants, or strand plants, may be readily divided into four groups:

1. The Mangrove-formation, covering the area of flood tide.

2. The Nipa-formation, distinguished through the presence of immense numbers of *Nipa fruticosa*, a small stemless palm which replaces the Mangrove in places where the water is less salt.

3. The Katappa-formation, growing just outside the reach of the

*Pfeffer, Pflanzenphysiologie I. S. 151.

flood tide on the strand, characterized by the growth of *Terminalia Katappa*, *Casuarina equisetiformis*, *Cycas circinalis*, *Pandanus*.

4. The Pescapræ-formation, named after *Ipomæa pescapræ*, which closes down on the strand vegetation from behind, together with occasional trees and shrubs, creeping vines and low plants of various kinds from different families of Gramineæ, Leguminosæ and Convolvulaceæ, growing in the sand, characterizing this zone.

Notwithstanding the fact that all these plants, except those in the Pascapræ formation, take their root in a constantly wet substratum, yet they are emphatically xerophyllous in their character. This peculiarity finds expression in the thick, fleshy leaves, in the reduction of the transpiring surface, in the hairy covering, and in the vertical position of many leaves.

The anatomical structure shows it still plainer in the thick walls, strongly cuticularized outer cell coverings, deeply sunken stomata and fully developed water system.

In Buitenzorg, where plants from the strand had been cultivated back in common soil, away from the direct influences of the sea, these modified characters have been largely lost. The leaves from *Soneratia acida*, a mangrove, are no longer insolatral, but bifacial, much thinner than in the mangrove. The stomata are no longer sunken, the epidermis has thiner walls and the cuticula is also thinner.

II.—The Alpine Flora of Java.

Java is noted for its volcanoes, often united into small mountain chains. On some of these volcanoes the ground has been well cultivated to a height of from four to five thousand feet. Higher up are large tracts of forest. Still higher we come to the lower line of the foggy region, where rain falls daily. In this moist region we have every where a reduction in the stem and root growth of trees and plants in general, and a great increase in the leaf-surface. The trees are slim and loosely branched. Epiphytes abound on all the branches. Passing through the foggy region, which does not extend to the top of the mountain, one loses the hygrophyllous character of the vegetation, and comes at once into an outspoken xerophyllous zone. Here the characters, as expressed in the foggy region, are reversed. The trees become

low and massive, the formation of wood is greatly emphasized, the leaves are thicker and much lessened in numbers, the root system is diminished and the branches become knotty and irregular, as is often seen in the Alps. Different kinds of Rhododendrons and Agapetes, which lower down grew only on trees, as epiphytes, change their habit and are found growing on the ground in great numbers Mosses and Lichens are covering the scraggy trees. As one goes still higher the trees lessen into low matted bushes, which cover the highest points of the mountain peaks. This last formation on the summit, which may be compared with the alpine savannas, and is about 8,000 feet high, differs much more from the lower zones of vegetation on the same mountain, than these alpine savannas do from the lower wooded regions of the Alps, although on the highest points of the mountains of Java snow is unknown and the temperature is for the whole year favorable to plant developemnt.

The peculiarity of the alpine flora is not due to the low temperature to which it is exposed, but to protective characters, developed in order to shield it against a too rapid transpiration. The habit of species from widely separated families is here the same.

The xerophyllous character of the alpine flora of Java finds its expression not alone in physiological characteristics, or in the presence of Australian forms (*Leucopogon, Coprosoma,*) or in the lack of Phanerogams and other common characters, but in the most striking microscopic changes in the anatomy of the parts, all looking toward the conservation of moisture.

Plants with such characters generally lose them when cultivated for a time lower down in the valleys.

The peculiarities of our alpine flora, such as the gnarly growths, thickening of leaves, tomentose coverings, &c., have up to the present time been considered as adaptations to the low winter temperature, and the pressure of the snow. These characters are found, however, on the mountains of Java, in a nearly constant summer temperature. I do not hesitate to say that these conditions, both in the Alps and in Java are referable to one and the same cause, i.e.: the greater transpiration caused by less dense atmosphere and increased insolation, these conditions rendering it more difficult for the plant to provide itself with the necessary

amount of water under such increased conditions of transpiration.

III.—Interchange of habitat between the Halophytes, Epiphytes and Alpine growths.

The resemblances existing between some of the strand plants and those of the alpine regions has already claimed some attention.

In Java this analogy may be easily observed. Between some of the strand trees and those of the high elevations there is great resemblance in the stunted and distorted appearance of each. *Dodonæa viscosa*, a common strand plant, appears suddenly at an elevation of 6,000 feet.

On some of the volcanoes within the region of fogs are found fumaroles. Around these the vegetation is entirely changed, becoming strongly xerophyllous. The Epiphytes, generally on trees in this belt, in the vicinity of the fumaroles, descend to the ground. Alpine plants are common here which usually occur at an elevation of 8,000 ft.

IV.—The Evergreen Woody Plants in Temperate Zones.

Many trees in the tropics drop their leaves at the beginning of the dry season. The leaf-fall in autumn in temperate zones the author also looks upon as protective in its character. Such trees could not make good the water lost on warm days in winter while the roots were frozen.

The fall of leaves both in warm and in tropical climates seems to depend more upon the dry period of such climates than on the change of temperature. Thus on such trees as *Pyrus communis*, *Pyrus Malus*, *Liriodendron Tulipifera*, and many others which drop their leaves normaly in the autumn the following observations were made. In the garden at Tjibodas, Java, where the climate changes but little in moisture or temperature throughout the entire year, the author observed on Dec. 13th, 1889, branches on any of these trees representing any or all seasons of the year, a definite time for leaf-fall having been entirely lost.

All our Evergreen trees are provided with some means of protection. This is especially true of the Pine family, the leaves of which are well provided with thick cuticula and sunken stomata.

All these modifications are looked upon as protective by the author, against a too rapid transpiration, and not against cold.

W. P. WILSON.

Index to Recent Literature Relating to American Botany.

Apical Growth of Liverworts.—Notes on the. D. M. Mottier. (Bot. Gaz., xvi. 141-143, pl. xii).

The following species are figured as examples: *Marchantia polymorpha, Asterella hemisphærica, Conocephalus conicus, Anthoceros lævis and Onoclea Struthiopteris.*

Botany of Jackson Co. [Mo.]—Report on the. B. F. Bush. (Thirty-first Ann. Rept. State Hort. Soc., Mo., 370–372).

This is a supplementary list to those previously published, and raises the number of uncultivated species known in the county to 1,004. The author should not designate it a list of plants "native" to the county, however, as a large number of the species are the usual naturalized foreigners. The large number of typographical errors shows evidence of very careless proof-reading.

Bromeliaceæ Schimperianæ. L. Wittmack. (Beiblatt, Engl. Bot. Jahrb. No. 29, 1-7).

A list of twenty-two species collected by Dr. W. Schimper in southern Brazil. *Bilbergia Schimperiana* and *Æchmea gamosepala* are described as new.

California Trees and Flowers. C. R. Orcutt. (West Am. Scientist, vii. 93–99; 123–133; 144–152; illustrated).

An alphabetical list designed to give brief descriptions of species which have been introduced into cultivation, or considered worthy of it. The list begins with *Abies bracteata* and ends with *Zygadenus Fremonti.*

Coca and its Therapeutic Application. Angelo Mariani. (Pamph. pp. 88, illustrated. New York, J. N. Jaros).

An interesting and freely illustrated account of *Erythroxylon Coca*, Lam., and the application of its leaves in medical treatment.

Continuity of the Protoplasm in the Chantransia Form of Batrachospermum. B. M. Davis. (Bot. Gaz., xvi. 149, with figure).

Enumeratio Plantarum Guatemalensium, Pars II. John Donnell Smith. (8vo, pp. 99, Oquawka, 1891).

This is a further enumeration of plants collected in Guatemala by Capt. John Donnell Smith and Baron H. de Tuerckheim, to-

gether with an appendix containing revisions of some of the former determinations. The numbers of these collections now run to something over 2450. The new species have been published in recent papers in the *Botanical Gazette*. This investigation of the Guatemalan flora is one of the most important of recent contributions to American Botany.

Epidendrum Sceptrum. (Bot. Mag., T. 7169).

Furcræa Bedinghausii. (Bot. Mag., T. 7170).

Ilex lævigata. (Gard. & For., iv. 220, 221; f. 39).

Immigrant Plants in Los Angeles County, California. A. Davidson. (West Am. Sci. vii. 138-140).

The following are mentioned: *Capsella bursa-pastoris, Erodium cicutarium, E. moschatum, Melilotus parviflora, Lolium perenne, L. temulentum, Dactylis glomerata, Phleum pratense, Festuca myurus, Phalaris Canariensis, Poa annua, Eragrostis poæoides, Panicum crus-galli, Bromus racemosus, Medicago sativa, M. denticulata, M. lupulina, Trifolium arvense, Brassica nigra, B. campestris, Mentha piperita, Marrubium vulgare, Nasturtium officinale, Malva borealis, Convolvulus arvensis, Silene Gallica, Stellaria media, Cerastium triviale, Anthemis Cotula, Silybum Marianum, Centaurea meletensis, Sonchus oleracea, S. asper, Taraxacum officinale, Vicia sativa, Dipsacus fullonum, Polygonum aviculare, Chenopodium album, Plantago major, P. lanceolata, and Urtica urens.*

Kritische Bemerkungen ueber die Geschichte der Vegetation Grœnlands. A. G. Nathorst. (Engler's Bot. Jahrb., xiv. 183-219, one map).

Leucocrinum montanum. Alice Eastwood. (West Am. Sci. vii. 141).

Lichenum Generis Cyrtidulæ Species nondum Descriptæ aut non vite Delineatæ. Arthur Minks. (Rev. Mycol., xiii. 55-65).

The following American species are noted: *Cytidula fuscorubella*, Minks, n. sp., on *Acer rubrum*, New Bedford, Mass. (Willey); *C. limbata*, Minks, n. sp., on *Sassafras*, same locality and same collector; *C. Idæica*, Minks, n. sp. on *Sambucus Canadensis*, same place and collector, also found on *Rubus Idæus* in Germany; *C. microspora*, Minks, n. sp., also collected by Mr.

Willey at New Bedford, on *Clethra alnifolia* and *Ilex verticillata* and also occurring in Germany.

Malpighiaceæ Novæ. F. Niedenzu. (Biebl. Engler's Bot. Jahrb. xiv. No. 30, 1-7; one plate).

Descriptions of new species in the genera *Mascagnia*, *Hiræa*, *Mezia*, *Gaudichaudia*, *Stigmatophyllon*, *Pilochæta*, and *Thryallis*, all from South and Central America.

Melocacti novi ex Insulis Archipelagi Indici Occidentali Neerlandicis, Curacoa, Aruba et Bonaire. W. F. R. Suringar. (Verslag. Akad. Vetensch. Amsterdam, Reeks 3, Deel 2, 183-195).

Method of Studying the Growth of Tubers.—A. Conway MacMillan. (Bot. Gaz., xvi. 149, 150).

Mission Scientifique du Cap Horn, 1882-1883, Lichens. J. Mueller. (4to, pp. 32, Paris, Gauthier Villars, 1888. See Bull. Soc. Bot. France, xxxvi. 60).

Missouri Botanic Garden.—Notes from the. (Gard. and For., iv. 225).

Monstrous Form of a Field Daisy.—A. B. W. Barton. (Bot. Gaz., xvi. 150, 151).

Naturalized Plants of Southern California.—Notes on the. S. B. Parish. (Zoe, i. 7-10; 56-59; 122-126; 182-188; 205-210; 261-265; 301-304; and ii. 26-34; also reprinted).

The author notes seventy-eight species, and the copious memoranda accompanying them are of great interest. In future years we have no doubt that many of these will appear rather curious reading, if some of the species mentioned spread as rapidly as they have done in the East. Thus in regard to *Daucus Carota*, we are told that two or three dozen were seen in a meadow at St. Elmo, and that this is their first recorded appearance in California.

New Grasses. Geo. Vasey. (Bot. Gaz.. xvi. 145-147).

Orcuttia Greenei, Eragrostis spicata, Muhlenbergia Alamosæ, Calamagrostis densus, and *C. kæleroides*, are described as new.

North Carolina Agricultural Experiment Station, Bulletin No. 76. (Pamph., 8vo, pp. 20, illustrated. Raleigh, N. C., 1891).

Under the head of "Plant Diseases and How to Combat

Them," are descriptions of *Læstadia Bidwelli*, *Perenospora viticola*, *Sphaceloma Ampelinum*, *Plowrightia morbosa*, *Monilia fructigena*, *Fusicladium dendriticum*, *Entomosporium maculatum*, *Phytopthora infestans*, *Puccinia graminis*, *Claviceps purpurea*, *Tilletia fœtens*, *Ustilago segetum*, and *U. Maydis*, the last three figured.

Notes from Columbus, Ohio. Aug. D. Selby. (Bot. Gaz. xvi. 148, 149).

The following western species are supposed to have been introduced from the cars or wagons of a traveling circus: *Erodium cicutarium*, *Aster paucifloras*, *Amphyachyris dracunculoides*, *Dysodia chrysanthemoides*, *Gutierrezia Texana*, *Helenium nudiflorum*, *H. tenuifolium*, *Parthenium Hysterophorus*, *Solanum rostratum*, *Monarda citriodora*, and *Croton capitatum*.

Notes on the Flora of the St. Croix Region. E. J. Hill. (Bot. Gaz. xvi. 108-113; 126-130).

Notes on the Distribution of Some Kansas Trees. S. C. Mason. (Gard. and For. iv. 182, 183; fig. 34).

Notes on the Cottonwood, (*Populus monilifera*).

Peat Bogs in New Brunswick.—On Raised. G. F. Ganong. (Bot. Gaz. xvi. 123-126).

Pitcairnia Roezlii. J. G. Baker. (Bot. Mag. T. 7175).

Quinoa. H. H. Rusby. (Reprint from Bull. Pharm., Mch. 1891, illustrated).

Chenopodium Quinoa is here described, mostly from the economic importance of its seed as an article of food in South America.

Report.—Department of Vegetable Physiology, J. E. Humphrey. (Eighth Ann. Rept. Mass. Agri. Exp. Sta. 200-226, Pl. i, ii).

Contains notes upon several fungus pests, with illustrations of *Plowrightia morbosa*, *Plasmopara Cubensis*, *P. Australis*, *Monilia fructigena*, and *Pythium de Baryanum*.

Report of the Secretary of Agriculture, 1890. (Cloth 8vo, pp. 612, illustrated. Washington, D. C., 1890. Also reprints of reports of Chief of Division of Vegetable Pathology, and Chief of Division of Forestry.).

Amongst the matters of botanical interest may be cited a report upon mushrooms of the United States, by the micro-

scopist, which is illustrated by two colored plates. Plate I contains representations of the following edible species: *Agaricus prunulus, A. procerus, A. arvensis, A. ostreatus, Russula heterophylla, Armillaria mellea, Lepiota cepæstipes*, var. *cretaceus*, and *Cortinarius cærulescens.* Pl. II is concerned with the following poisonous species: *Hygrophorus conicus, Russula emetica, Agaricus æruginosus, Agaricus* (*Amanita*) *vernus, A. Muscarius, Lactarius rufus, L. piperatus, Phallus impudicus, Boletus Satanus, B. felleus, B. piperatus*, and *Clathrus cancellatus.* Under the report of the Botanist is an article on noxious weeds, in which the following plants are described and figured: *Ambrosia trifida, Hieracium aurantiacum, Linaria Canadensis, Cuscuta trifolia, Plantago lanceolata*, and *Cenchrus tribuloides.* The Chief of the Division of Vegetable Pathology contributes in his report descriptions and colored plates of *Colletotrichum Althææ, C. Gossypii*, and *Glœosporium fructigenum.* Under the head of "Nut Culture," is an illustrated account by the Pomologist of *Hicoria Pecan*, both wild and in cultivation. A. H.

Revision of the American Species of Epilobium occurring North of Mexico. William Trelease. (2d Ann. Rep. Missouri Bot. Gard. 69-117; 48 plates. Reprint issued April 22d, 1891).

Professor Trelease has made a critical study of the species of this difficult genus, extending over more than two years. He has found that the greatest confusion prevails in the local floras and herbaria of this country as to the species, and bases his work on Haussknecht's "Monographie der Gattung *Epilobium*," published in 1884, although he has not been able to recognize in American material all the species maintained by that author and finds several undescribed ones to add.

Copious references to literature on the biologic features of the genus are given in the introduction. 38 species are then described at length, the following as new: *E. clavatum*, from Washington to Wyoming and Utah; *E. ursinum*, Parish, California to Washington; *E. delicatum*, Oregon, besides several new varieties. Original names are upheld, and authors cited in parenthesis if the rank of a species has been changed to variety; there is one apparent exception, however, in *E. oliganthum*, Michx., (1803) being referred as a variety to *E. lineare*, Muhl (1813). The plates il-

lustrate the general aspect of the plants, their seed stigmas and methods of vegetative propagation. American botanists owe a debt of thanks to Professor Trelease, for bringing order out of a chaotic genus. N. L. B.

Sap and Sugar of the Maple Tree.—The. W. D. Ely. (Gard. and For. iv. 171, 172; 183, 184; 207, 208).

Notes upon the making of maple sugar by the Indians.

Sapotaceæ.—Beitraege zur Kenntnis der. A. Engler. (Engler's Bot. Jahrb. xii. 496-525).

A discussion of the structure and classification of this natural order. A considerable number of new species are described, and the priority of several genera over those adopted by Bentham and Hooker is pointed out. The items of direct interest to American botanists are as follows: *Vitellaria nitidula* is a new species from Cuba, and *Lucuma Warmingii*, Eichl. is referred to this genus; *V. tenuifolia* from Cuba and *V. glaucophylla* from Brazil are also new; *Poutaria Schenckii* and *P. crassinervia* are new species from Brazil; *Labatea ciliolata* from Brazil, *L. Tovarensis*, from Columbia; *Bumelia Mexicana* and three South American species of *Chrysophyllum* are here first described, and *Mimusops Sieberi*, Chapm., from Florida, as represented by Curtiss No. 1766, is separated as *M. Floridana*, Engl. N. L. B.

Silphium laciniatum, L. B. L. Robinson. (Bot. Gaz .xvi. 114, 115).

A description of two apparent varieties of the species and a request for specimens and memoranda.

Sisal in the Bahamas.—Cultivation of. J. I. Northrop. (Reprint. Pop. Sci. Monthly, Mch. 1891; illustrated).

A comprehensive description of *Agave rigida*, var. *longifolia* and *A. rigida*, var. *Sisalina*, with account of its surroundings and conditions connected with it.

Solanaceæ from Guatemala—Some New. John M. Coulter. (Bot. Gaz. xvi. 144, 145). *Solanum Donnell-Smithii*, *Brachistus Escuintlensis*, *Bassovia Donnell-Smithii* are described as new.

Some Early Native Flowers. F. H. Horsford. (Gard. and For. iv. 199, 200).

Species under the genera *Anemone*, *Erythronium*, *Trillium*,

Trollius, Mertensia, Dodecatheon and *Hepatica.* The article is written from the Botanical Garden, St. Louis, Mo.

Sugar Maple.—The. (Gard. and For. iv. 170, fig. 32).

Contains an excellent representation of the typical *Acer saccharum* as it grows in New Hampshire.

Vanilla planifolia. (Bot. Mag. T. 7167).

Water Plant—A Common. Jas. H. Stoller. (Pop. Sci. News, xxv. 64, 65; illustrated).

An illustrated general description of the genus *Chara.*

West Indies—A Visit to the. A. S. Hitchcock. (Bot. Gaz. xvi. 130–141). Botanical notes on a trip during the months of Nov., Dec., and Jan., 1890-91.

Proceedings of the Club.

WEDNESDAY EVENING, MAY 27TH.

The President in the chair and twenty-three persons present.

Mrs. Sarah L. Clark, Miss T. U. Tyler, Dr. Ameen T. Haddad, Col. Delancy Floyd-Jones, and Mr. Wm. Clitus Witter were elected active members.

Dr. Rusby exhibited a collection of South American woods and remarked upon their uses and economic values.

TUESDAY EVENING, JUNE 9TH.

Dr. Morong in the chair and twenty-three persons present.

Mrs. C. A. Wood and Mrs. S. Loines were elected active members.

Miss Emma J. Thompson was elected a corresponding member.

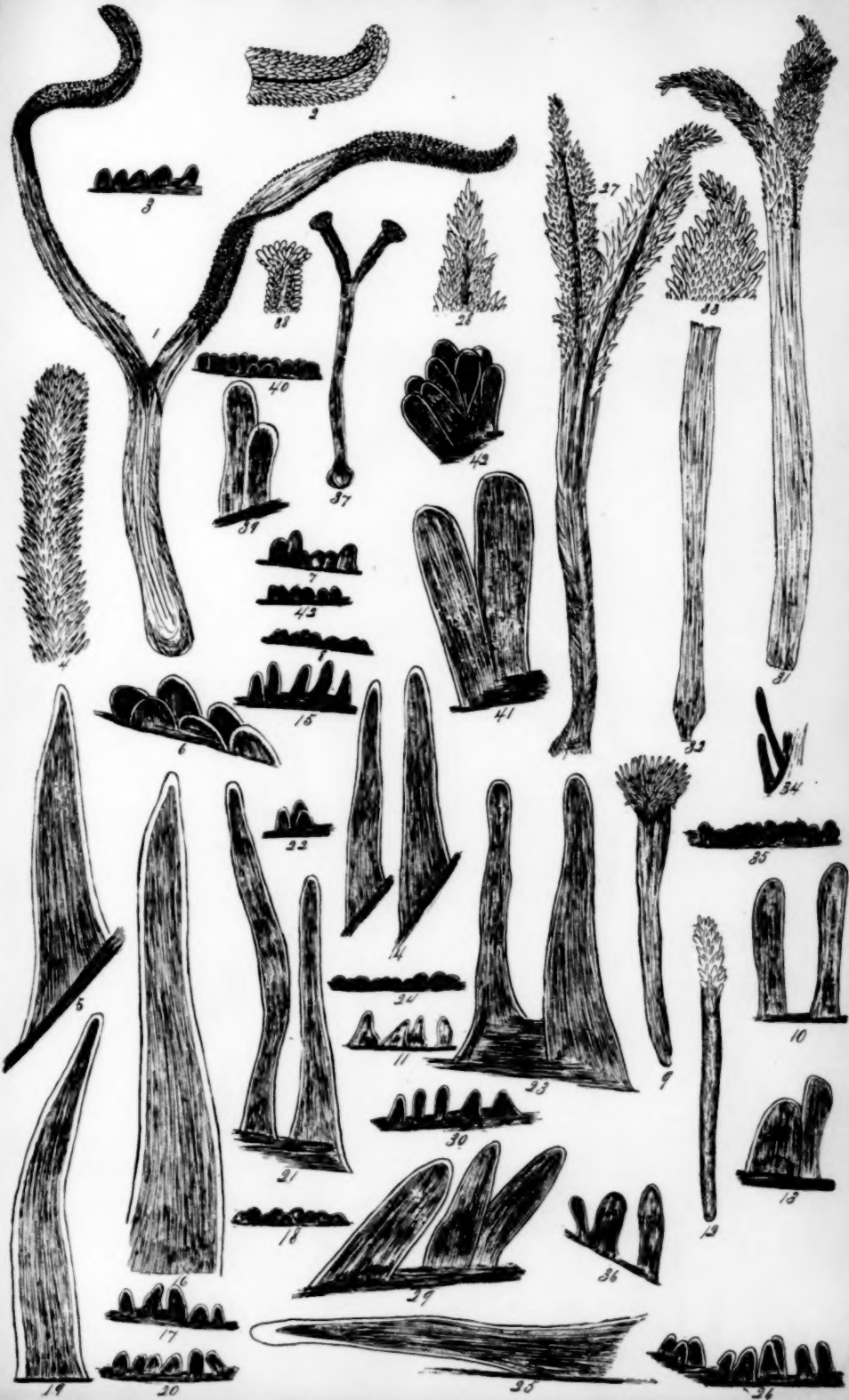
The chairman of the Field Committee reported that more than sixty persons attended the excursion to Short Hills, N. J. June 6th, on invitation of Messrs. Pitcher and Manda. The following resolution was adopted:

That the thanks of the Torrey Botanical Club be tendered to Messrs Pitcher and Manda for the invitation extended by them to the club to visit their gardens at Short Hills, N. J., and for their courtesy and hospitality, which made the excursion the most enjoyable of the season.

Mr. Lighthipe reported *Hieracium aurantiacum* at Woodbridge, N. J., and *Arisaema Dracontium* at Rahway, N. J.

The announced paper of the evening, "Plants collected in Middle Florida" was then read by Mr. Lighthipe.

On motion adjourned to Tuesday, Oct. 13th.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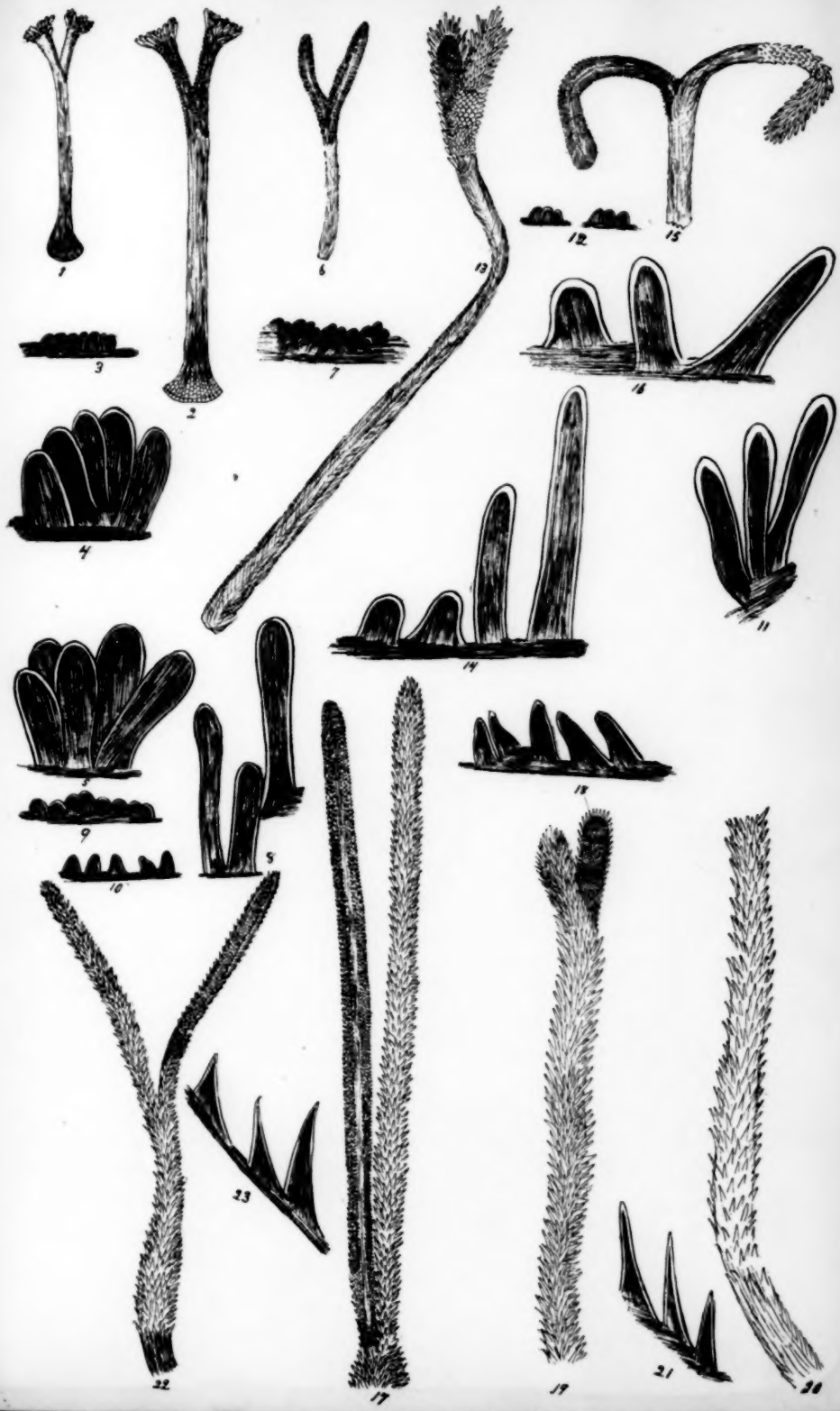
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